CLAIMS

1. An electrical machine having an air gap (4), delimited by a field device, consisting in the form of at least two bodies (6, 7) at a distance from one another, with each one first body (6) located neighboring one second body (7), and with magnetic poles (27), belonging to at least one of the sides of the first and second body which face each other, which are magnetized orthogonally to the air gap, extend essentially over the entire air gap transverse to a direction of movement, each as a whole or divided into partial poles, and which are preferably backed with return path material, which alternate in the direction of movement, and whose field runs essentially in a straight line inside the pole surface region of each pole from one boundary surface of the air gap (4) to the opposite boundary surface, which either also has magnetic poles or consists predominantly of return path material, and at least one two-pole air-core coil (3) or a winding (29) with two-pole air-core coils (3), which have no contact to return path material, extend, in section transverse to the direction of movement, into the air gap (4) approximately in the middle and at an equal distance from the first and second bodies, move relative to the field device and thus each coil side of the at least one air-core coil traverses the direction of movement, and are connected at the outer edge of the air gap (4) with another coil side directly or via predominantly inactive conductor or winding head conductor into at least one air-core coil (3), characterized in that the air gap (4), in section transverse to the direction of movement, consists of at least two neighboring air gap sections (4', 4"...), each two of which abut one another with their air gap boundary surfaces belonging to the first body at the joint edge (10) arising in this way, and

each coil side of the at least one air-core coil (3) runs through the air gap with its air gap sections, with each edge (10) changing its geometric form and thereby completing a bend or fold around the first body and each coil side running essentially in the air gap (4).

2. An electrical machine according to the generic portion of claim 1, characterized in that the air gap (4), in section transverse to the direction of movement, consists of at least one curved air gap section (4'), which is delimited by the inside of the first body and in which each coil side of the at least one air-core coil (3) extends essentially along the full length of the curve, and the coil sides run through the air gap with its air gap sections and essentially in the air gap (4).

3. An electrical machine according to claims 1, 2, characterized in that the air gap (4), in section transverse to the direction of movement, consists of at least one curved air gap section (4'), which is delimited by the inside of the first body and in which each coil side of the at least one air-core coil (3) extends essentially along the full length of the curve, and the coil sides run through the air gap with its air gap sections and essentially in the air gap (4), and the at least one air gap section (4') is preferably in the shape of a circular arc.

4. An electrical machine according to claim 2, characterized in that, in section transverse to the direction of movement, the at least one curved air gap section (4') is an irregular curve, and is preferably elliptical.

5. An electrical machine according to claim 4, characterized in that, in section transverse to the direction of movement, the elliptical air gap section (4') is a flat ellipse and thereby preferably includes either one main apex and two secondary apexes or two main apexes and one secondary apex of the ellipse.

6. An electrical machine according to claims 1 to 5, characterized in that the air-core pole (3) is located essentially within the air gap (4) or within the air gap (4) having the air gap sections (4', 4"...).

7. An electrical machine according to claims 1, 6, characterized in that at least two neighboring air gap sections (4', 4"), in section transverse to the direction of movement, are straight and lie at an angle of preferably 90° to one another, whereby they intersect one of their boundary surfaces, belonging to the first body, forming an angular edge (10) of the first body, which is preferably rounded off.

8. An electrical machine according to claims 1 to 6, characterized in that, in section transverse to the direction of movement, at least two neighboring air gap sections (4', 4") abut one another at a boundary surface, belonging to the first body, forming the edge (10), with one air gap section (4') straight and one air gap section (4") curved, preferably circular.

9. An electrical machine according to claims 1 to 6, 8, characterized in that, in section transverse to the direction of movement, at least two neighboring air gap sections (4', 4") transition directly into one another.

10. An electrical machine according to claims 1 to 9, characterized in that, in section transverse to the

direction of movement, the air gap (4) is assembled from three air gap sections (4', 4", 4'"), with two straight air gap sections (4', 4'") lying in parallel connected through a third air gap section (4"), which is either straight and lies at a 90° angle to each of them or is a curved air gap section.

11. An electrical machine according to claims 1, 7, characterized in that the air gap (4), in section transverse to the direction of movement, consists of at least two air gap sections (4', 4") lying in parallel, with the boundary surfaces abutting at edge (10) consisting predominantly of return path material and belonging to a narrow slot-shaped first body and the magnetic poles (27) belonging to the air gap boundary surface of the second body.

12. An electrical machine according to claims 1 to 12 [sic], characterized in that, in section transverse to direction of movement, the air gap (4) consists of several abutting air gap sections (4', 4"...), which are straight or curved, through which each coil side of the at least one air-core coil (3) runs and which thereby complete at least one left bend and one right bend.

13. An electrical machine according to claim 12, characterized in that in addition at least three straight air gap sections (4', 4", 4'"), in section transverse to the direction of movement, lie parallel to one another.

14. An electrical machine according to claim 12, characterized in that the air gap (4), in section transverse to the direction of movement, thereby consists of three straight air gap sections (4', 4", 4'"), with two air gap sections (4', 4") lying

parallel to one another, and the third air gap section (4'") assuming an angle of 90° to them.

15. An electrical machine according to claims 1 to 14, characterized in that a conductor (20) of the air-core coil (3) in the folded region (18) in the region of the edge (10) is also at least partially penetrated by the magnetic field, with the magnetic field not running from one air gap boundary surface to the other in essentially a straight line.

16. An electrical machine according to claims 1 to 15, characterized in that, in section transverse to the direction of movement, at least two neighboring air gap sections (4', 4") of the air gap (4) contain, in their boundary surfaces which belong to the first body and abut one another, magnetic partial poles which form, out over the joint edge (10), a joint continuous pole which is magnetized orthogonally to its air gap boundary surface.

17. An electrical machine according to claims 1 to 10, 12 to 15, characterized in that, in section transverse to the direction of movement, in two neighboring air gap sections (4', 4"), the magnetic poles (27) belong at least to different boundary surfaces of the air gap (4) and the magnetic poles of the one air gap section (4'), which belong to the boundary surface of the first body, lie with their faces at a distance to the return path material of the abutting, neighboring boundary surface of the other air gap section (4"), which consists at least predominantly of return path material.

18. An electrical machine according to claims 10, 15, 17, characterized in that, in section transverse to the direction of movement, the air gap (4) is composed of

at least three air gap sections (4', 4", 4'"), with two straight air gap sections lying in parallel (4', 4"') connected by a straight third air gap section (4"), and magnetic poles (27) belong to at least one of the two parallel boundary surfaces of the parallel air gap sections of the first body and are affixed to at least one of the sides of a slot-shaped return path body (19) belonging to the first body (6), and the boundary surface of the air gap section (4"'), which connects the two edges (10), in which one boundary surface of the air gap section 4'" abuts one of each of the air gap sections 4' and 4", consists at least predominantly of return path material and preferably forms a flat return path of the first body (6), which is a return path flat band (9), which lies at a distance to the faces of the magnetic poles and is connected with the return path body (19) approximately in the middle or on one edge (10), and an air gap boundary surface of the air gap section (4'"), to which magnetic poles (27) belong, lies opposite to the return path flat band (9).

19. An electrical machine according to claims 1 to 8, 10 to 18, characterized in that, in section transverse to the direction of movement, at least one second body (7) in the folded region (18) in the region of the edge (10) at least partially follows the conductor (20) or a curved coil trace at a uniform distance.

20. An electrical machine according to claims 1 to 8, 10 to 18, characterized in that at least one second body (7) is connected via its edges lying in the direction of movement with a return path flat band (5) which delimits the air gap (4) on one side in the folded region (18) in the region of an edge (10).

21. An electrical machine according to claim 20, characterized in that the return path flat band (5) carries magnetic poles (27), on the side toward the air gap, which extend transverse to the direction of movement, alternate in the direction of movement, and are magnetized in the direction of the first body (6), preferably in the direction of the edge (10).

22. An electrical machine according to claims 1 to 21, characterized in that it is composed of several machines which use a joint second body (7) of the field device, which is preferably implemented as a permanent magnet body (23), with it magnetized orthogonally to the direction of movement and to the air gap boundary surface and with both of the two pole surfaces of the magnet body delimiting at least one air gap section of the two electrical machines.

23. An electrical machine according to claims 1 to 22, characterized in that, in section transverse to the direction of movement, first and second bodies (6, 7) are securely connected directly or via a body, which is preferably a return path, at the outer edges of the opposing boundary surfaces of the air gap (4), with the second body having at least one continuous slot in the direction of movement, for leading through the coil support (21), which divides the air gap boundary surface of the second body approximately in the middle in the direction of extension of the air gap (4) and/or is located in a folded region (18) of the at least one air-core coil (3).

24. An electrical machine according to claims 1 to 22, characterized in that, in section transverse to the direction of movement, first and second bodies (6, 7) are securely connected directly or via a body, which is preferably a return path, at the outer edges of the

opposing boundary surfaces of the air gap (4), with the second body (7) continuously delimiting the air gap (4) opposite to the first body (6) and the coil support (21) connected at the other outer edge of the air gap (4) with a winding head or an inactive conductor region of the at least one air-core coil (3) and led out of the air gap region.

25. An electrical machine according to claims 1 to 24, characterized in that the field device is surrounded by a housing (2) or is itself the housing or part of the housing, and either the at least one air-core coil (3) is securely connected with the shaft (1) or axle (24), with the field device journaled directly and/or via a housing (2), or the at least one air-core coil (3) is journaled directly and/or via a coil support (21) and/or via a housing (2) on the shaft or axle (24), and the field device is thereby securely connected with the shaft or axle.

26. An electrical machine according to claims 1 to 25, characterized in that the movement is linear.

27. An electrical machine according to claims 1 to 25, characterized in that the movement of the field device and the at least one air-core coil (3) is rotational relative to an axle (24) or a shaft (1).

28. An electrical machine according to claims 1 to 9, 11 to 15, 19 to 25, 27, characterized in that, the field device, at least in the shape of at least three coaxial disk-shaped bodies (6, 7) lying at intervals, each as a disk or disk ring (16), is located on the axle (24) or shaft (1), with each one disk-shaped body (6) located neighboring one second disk-shaped body (7), and these, in section transverse to the direction of movement, each delimiting one air gap section (4',

4"...), whose boundary surfaces belonging to the first body abut at the outer edge (10) of the first body, and magnetic poles (27) belong to the second disk-shaped body on the side toward the air gap, which are magnetized orthogonally to the air gap, preferably axially, which extend in the direction of the axle, preferably radially, and which alternate around the periphery, and at least one air-core coil (3), each coil side of which changes its geometric form at the outer edge (10), and which is bent or folded around the first body (6), with this being a very thin disk-shaped body, at least in its peripheral region, with boundary surfaces which predominantly consist of return path material, and which is preferably a thin return path disk of uniform thickness, and each coil side on both sides of the first disk-shaped body (6) extending into the air gap sections (4', 4"), approximately in the middle between each two disk-shaped bodies and at equal distances from them, in the direction of the axle or shaft, and is connected in its region nearest the axle with another coil side into an air-core coil (3), with the first and second disk-shaped bodies rotatable uniformly with one another and relative to the at least one air-core coil (3).

29. An electrical machine according to claims 1 to 10, 12 to 25, 27, characterized in that the field device, at least in the shape of at least three coaxial disk-shaped bodies (6, 7) lying at intervals, each as a disk or disk ring (16), is located on the axle (24) or shaft (1), with each one disk-shaped body (6) located neighboring one second disk-shaped body (7), and these, in section transverse to the direction of movement, each delimiting one air gap section (4', 4"...), which each run on one side of the first disk-shaped body (6) in the direction of the shaft (1) or

axle (24) and magnetic poles (27) belong to at least one of the facing sides of the first and second disk-shaped bodies which are magnetized orthogonally to the air gap boundary surface, preferably axially, which extend in the direction of the axle, preferably radially, and which alternate around the periphery, with the first body (6) preferably consisting of a slot-shaped return path body (19), which, in section transverse to the direction of movement, is very narrow, and magnetic poles (27) which it carries on one of its sides, and the field device delimits a further air gap section (4") in the peripheral region whose boundary surface belonging to the first body abuts each of the boundary surfaces also belonging to it of the neighboring air gap sections (4', 4'") in each edge (10), and at least one air-core coil (3), with each coil side running at least partially through the air gap in the peripheral region and changing its geometric shape at both outer edges (10) of the first body (6) and bent or folded around the first body, extending outward from there on both sides of the first disk-shaped body (6) in the direction of the axle or shaft, into each of the air gap sections (4', 4") approximately centrally between each two disk-shaped bodies at equal distances from them and connected there with another coil side into an air-core coil (3), with the field device rotatable relative to at least one air-core coil (3) and the first and second disk-shaped bodies thereby preferably moving uniformly with one another, and preferably a field device delimiting an air gap at least partially enclosing a conductor (20) along its length in the folded region (18) in the region of at least one edge (10) of the at least one air-core coil (3).

30. An electrical machine according to at least one of the claims 1 to 25, 27 to 29, characterized in that the

field device is located at least in the form of at least two coaxial nested drum-shaped bodies (6, 7) at a distance from one another on the axle (24) or shaft (1), with each one first drum-shaped body (6) located neighboring one second drum-shaped body (7) and these, in section transverse to the direction of movement, each delimiting one air gap section (4', 4"...), with two straight air gap sections or at least one straight and one curved air gap section or at least one curved air gap section forming the air gap (4), which approaches the axle or shaft in at least one region, with each coil side of the at least one air-core coil (3), during its course through the air gap (4) in the direction of the axis or shaft, bent within at least one curved air gap section and/or changing its shape on at least one edge (10), at which two neighboring air gap sections at a time abut at their boundary surfaces belonging to the first body, and bending or folding around the first body (6) and extending over the entire air gap (4) approximately centrally between the first and second body and at approximately equal distances from them, and the magnetic poles (27), which delimit the air gap (4) and each air gap section (4', 4"...) on at least one side, are preferably magnetized orthogonally to their air gap boundary surface, extend along the air gap in section transverse to the direction of movement, and alternate around the periphery, and the field device rotates relative to the at least one air-core coil, with the first and second bodies (6, 7) of the field device preferably securely connected and preferably moving uniformly with one another.

31. An electrical machine according to claim 30, characterized in that the first drum-shaped body (6) has the shape of a hollow or full circular cylinder and the second drum-shaped body (7) has the shape of a

hollow circular cylinder, with at least one of the facing shell sides of the first and second bodies (6, 7), which delimit an air gap section (4"), containing magnetic poles (27) which are preferably radially magnetized and alternate around the periphery, and, in section transverse to the direction of movement, at least one of the facing sides of the first and second body, on the face of the first body, which delimits an air gap section (4'), contains magnetic poles (27), which are preferably magnetized orthogonally to the air gap boundary surface and preferably axially and which alternate around the periphery, and the edge (10) is formed by the abutting boundary surfaces of the shell and face sides of the air gap section (4', 4") belonging to the first body, which preferably lie orthogonally to one another, each coil side of the at least one air-core coil is bent or folded around it and it extends from there outward into the air gap section (4") on the shell side, preferably axially, and in the direction of the axle or shaft in the air gap section (4') on the face side, preferably radially or radially projected.

32. An electrical machine according to claim 30, characterized in that the first drum-shaped body (6) has the shape of a hollow or full circular cylinder and the second drum-shaped body (7) has the shape of a hollow circular cylinder, with at least one of the facing shell sides of the first and second bodies (6, 7), which delimit an air gap section (4"), containing magnetic poles (27) which are preferably radially magnetized and alternate around the periphery, and, in section transverse to the direction of movement, at least one of the facing faces of the first and second body, which delimit an air gap section (4') on one face of the first body and delimit an air gap section (4'") on its other face, containing magnetic poles

(27), which are preferably magnetized orthogonally to the air gap boundary surface and preferably axially and which alternate around the periphery, with the air gap sections (4', 4 "), in section transverse to the direction of movement, preferably lying orthogonally to the air gap section (4'"), and the boundary surfaces, belonging to the first body, of one air gap section on the shell side and one air gap section on the face each abutting in an edge (10) of the first body, around which each coil side of the at least one air-core coil (3) is bent or folded and extends from there preferably axially into the air gap section (4") on the shell side and preferably radially or radially projected into the air gap sections (4', 4'") on the face, each in the direction of the axle or shaft.

33. An electrical machine according to claims 30 to 32, characterized in that the first drum-shaped body (6) has the shape of a hollow or full circular cylinder and the second drum-shaped body (7) has the shape of a hollow circular cylinder, with at least one of the facing shell sides of the first and second bodies (6, 7), which delimit an air gap section (4"), containing magnetic poles (27), which are preferably radially magnetized and alternate around the periphery, and the circular cylinder, in section transverse to the direction of movement, having faces slanted or bent inwards on at least one side toward the axle (24) or shaft (1), with at least one of the facing faces of the first and second body, which delimits an air gap section (4') on the face on at least one side of the first body, containing magnetic poles (27), which are preferably magnetized orthogonally to the slanted or along the bending radius and which alternate around the periphery, and at least one edge (10) formed by the abutting boundary surfaces belonging to the first body (6) of the air gap sections on the shell side and

face, in which each coil side of the at least one air-core coil (3) changes its geometric shape and is bent or folded around the first body during its course through the air gap and extends preferably axially into the air gap section (4") on the shell side and into at least one air gap section (4,4'") on the face in the direction of the axle or shaft and preferably radially projected.

34. An electrical machine according to claim 30, characterized in that the field device is in the form of at least three cylindrical bodies (6, 7) and the cylindrical body nearest the axle is a full or hollow cylinder and all further bodies (6, 7) are hollow cylinders and are nested in each other at a uniform interval at least on the shell side, with, in axial section, the boundary surfaces of one first body (6) and one second body (7) at a time delimiting one air gap section (4', 4"...) at a time, which each extend axially on the inner and outer shell surfaces of the first hollow cylinder (6), and at least one of the facing shell surfaces of the first and second cylindrical bodies having magnetic poles (27), which are preferably radially magnetized, extend axially, and alternate around the periphery, and preferably at least one of the facing faces of the first and second cylindrical bodies (6, 7), which delimit an air gap section (4'"...) or a folded region (18) on at least one side of the first body, also having magnetic poles (27), which are preferably axially magnetized, extend in the direction of the axle or shaft, and alternate around the periphery, and each coil side of the at least one air-core coil (3) bent around at least one edge (10) of a hollow cylindrical first body, which is formed by each two neighboring, abutting boundary surfaces of neighboring air gap sections, and extending axially from there outward on both sides of

the edge (10) into an air gap section on the face or on one side into an air gap section on the face in the direction of the axle (24) or shaft (1), preferably radially or radially projected, and on the other side into an air gap section on the shell side, preferably axially.

35. An electrical machine according to claims 1 to 26, characterized in that the field device consists at least in the form of at least two long bodies (6, 7), with each one first long body (6) located neighboring one second long body (7), in section transverse to the direction of movement, and these each delimiting one air gap section (4', 4"...), with two straight air gap sections or at least one straight and one curved air gap section or at least one curved air gap section forming the air gap (4), with each coil side of the at least one air-core coil (3) bent in its course through the air gap (4) around at least one first body (6) within at least one curved air gap section and/or changing its geometric shape at least one edge (10), in which each two neighboring air gap sections abut at their boundary surfaces, and bent or folded around the first body (6), and extending over the complete air gap (4) approximately centrally between the first and second body and at approximately the same distance from both of them, and the magnetic poles (27), which delimit the air gap (4) and each air gap section (4',4"...) on at least one side, preferably magnetized orthogonally to their air gap boundary surface, extending, in section transverse to the direction of movement, along the air gap (4), and alternating around the periphery, and the field device moving linearly relative to at least one air-core coil, with the first and second bodies (6, 7) of the field device preferably securely connected and moving together uniformly.

36. An electrical machine according to claim 35, characterized in that the long bodies (6, 7) are at least three long, plate-shaped bodies (6, 7) of a small, uniform thickness, which lie at uniform intervals from one another, with an air gap section (4', 4 "...) located between each first plate-shaped body (6) and second plate-shaped body (7), and the air gap sections lying parallel to one another in section transverse to the direction of movement, with the plate-shaped bodies (6, 7) being long relative to their width and the long sides lying in the direction of movement and magnetic poles (27) belonging to at least one of the facing sides of the first and second plate-shaped bodies (6, 7) which extend transverse to the direction of movement and are magnetized orthogonally to the surface of the plate-shaped body (6, 7) delimiting the air gap, and the boundary surfaces belonging to the first body (6), which has, in section transverse to the direction of movement, a narrow, slot-shaped surface, the two neighboring air gap sections (4', 4"...) abutting one another on one long side at the edge (10) around which each of the coil sides of the at least one air-core coil (3) is bent or folded, extends from this folded region (18) into the air gap section, and is connected, in the region of the other opposite long edge of the first plate-shaped body (6), with another coil side into an air-core coil (3), and the at least one air-core coil moving linearly relative to the field layout.

37. An electrical machine according to claim 36, characterized in that the first and second long bodies (6, 7) are connected with one another in the direction of movement at their beginning and their end by a body.